SURVEY ON WIRELESS SENSOR NETWORK AND ITS APPLICATIONS WITH EFFICIENT ROUTING MECHANISM

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ABSTRACT

The Wireless sensor network (WSN) is promising network architecture. It used in many applications such as monitoring the environment, detecting the object, tracking the event, and security surveillance.WSNs consist of large numbers of very small autonomous wireless devices, called sensor nodes. Sensor nodes perform multiple functions such as sensing, computing, and communication. Energy is the basic need for the sensor nodes to perform its function. Sensor nodes are battery-powered devices. Charging batteries for sensor node is difficult in WSN. If the node drains its energy completely, it will become dead node. If the energy exhausts during transmission, the routing path is destroyed and the packet delivery ratio is decreased. Routing is the process of selecting paths in a network along which the packets move from one host to the other. Sensor nodes must report the sensed data to a central node, called sink. Routing mechanisms ensure reliable communication without unnecessary energy consumption. In order to have a communication between source and sink, Link based routing is used. This paper provides the background of wireless sensor network.

KEYWORDS: Sensor node, Networking Standard, Dead node, Routing.

I. INTRODUCTION:

In typical WSNs, a central node called sink sends query message to other nodes in the network. The sensor nodes (i.e., source nodes) must report the sensing or monitoring data to the sink. Charging batteries for sensor nodes is often difficult since the sensor nodes are battery-powered devices. Data transmission is the major source of energy consumption compared to sensing, communication, and computation. It is important to design an energy efficient routing scheme for sensed data to achieve high delivery ratio to increase the network lifetime.

II. ARCHITECTURE OF SENSOR NODE:

The WSN is built of "nodes" – from a few to several hundreds or even thousands, where each node is connected to one (or sometimes several) sensors. Each such sensor network node has typically several parts: a radio transceiver with an internal antenna or connection to an external antenna, a microcontroller, an electronic circuit for interfacing with the sensors and an energy source, usually a battery or an embedded form of energy harvesting. A wireless sensor node is composed of four basic components.

In addition to the above units, a wireless sensor node may include a number of application-specific components, for example a location detection system or mobiliser. For this reason, many commercial sensor node products include expansion slots and support serial wired communication.

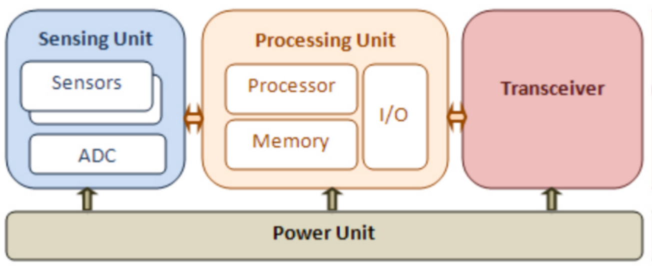

Fig. 1 Architecture of a sensor node.

The miniaturization of sensor node requires special processors which are small in size and have low processing power. The controller performs tasks, process as data and controls other functionality of a sensor node. The transmitter and receiver are combined into a single device called transreceiver. Sensor nodes often use ISM (Industrial, Scientific and Medical) band. Small size of a sensor node results in corresponding constraints on memory also. Sensor nodes have very simple memory architecture. Sensor nodes use flash memories due to their cost and storage capacity. One of the most important components of a wireless sensor node is the power supply.

III. ADVANTAGES OF WIRELESS SENSOR NETWORKS:

Ease of Deployment:

In a sensor network hundreds or thousands of nodes can be deployed in remote or dangerous environment. Since these nodes are small in size and economical, throwing of hundreds or thousands of sensors from a plane over a remote or dangerous area allows extracting information is such a way that could not have been possible otherwise.

Fault Tolerance:

In wireless sensor networks several sensor nodes are deployed close to each other. They are able to overcome node failures, resulting of destroyed or dead nodes by simply using another routing path. For example during war, if an enemy destroys a surveillance sensor node, this will not affect the whole network.

Ability to Cover Wide and Dangerous Areas:

For example, setting-up of a wired network on a battlefield would not be possible.

Self Configurable:

When sensor nodes are deployed, they have the ability to self configure in network discovery and multihop broadcast in small amount of time.

Mobility of Nodes:

In the last few years, mobility of nodes has been used to trace the event for permanent tracking. Recently developed protocols and architectures are able to handle these real shifting to maintain further routing.

Improved Lifetime:

The sensor nodes are located close to each other. They can be grouped together. From this group only one node can be used in a round robin fashion to collect data and send to base station. It will enhance the lifetime.

Improved Accuracy:

In WSNs, the closely located sensor nodes sensing and collecting the data about the same event will result in better accuracy and reduced uncorrelated noise.

IV. APPLICATIONS OF WIRELESS SENSOR NETWORK:

Wireless sensor networks enable a paradigm shift in the science of monitoring, and constitute the foundation of a broad range of applications related to security, surveillance, military, medical, and environmental monitoring. Some existing real life applications are given below.

Military Applications:

Sensor network research was initially driven by military applications such as surveillance and enemy tracking. In battle field surveillance, sensor networks closely watches the activities of the opposing forces.

Environment Observation:

Environment monitoring networks span large geographic areas to monitor and forecast physical processes such as environment pollution, forest fire detection and flood detection etc. Sensors are deployed for monitoring of rainfall, water level and weather.

Agriculture:

In agriculture sensor networks are used to monitor the pesticides level in the

drinking water, the level of soil corrosion and the level of air pollution. They are also helping in strategic planning and counter measures to increase the yield of the crop.

Medical Applications:
In medical field, sensor networks are used for tracking and monitoring the doctors and patients inside a hospital. Each patient has small and light weight sensor nodes attached to them. Biosensors are implanted in the human body to monitor the patient's physiological parameters such as heart beat or blood pressure.

Home Automation:
Smart sensor nodes and actuators are used in applications, such as vacuum cleaners, microwave oven and refrigerator. These sensor nodes can interact with each other and with the external network via the internet or satellite. They allow end users to manage home devices locally and remotely more easily.

Disaster Management:
The early warning system based on WSN can be reliably deployed in areas with high risk of disasters. The use of WSN promises to provide real time information of the disaster area to rescue teams making coordination and planning more effective.

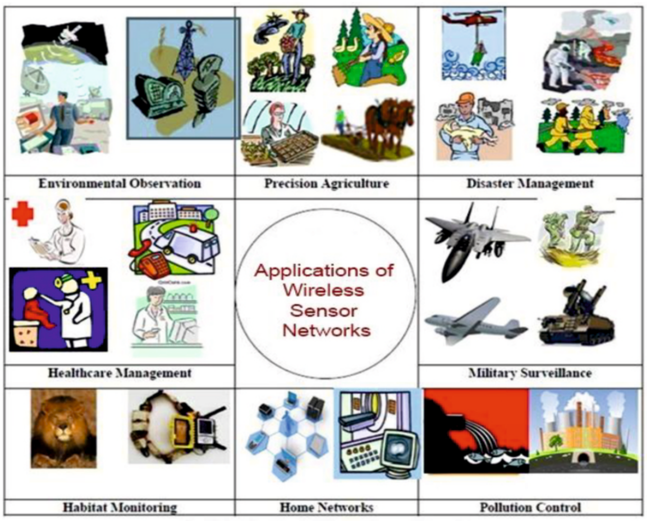

Fig. 2: Applications of Wireless Sensor Networks.

V. CHALLENGES OF WIRELESS SENSOR NETWORK:

Limited Energy:
A sensor node has limited energy storage. For this reason, efficient use of this energy will be vital in determining the range of application for these sensor networks. In most cases, renewing energy is not feasible or even impossible

Network Lifespan:
Limited resources and energy in sensor nodes results in limited lifespan in a network. Ideally, a network should become ineffective only when all nodes become exhausted. In reality, the lifespan of a sensor network is the minimum time up to which the network is functionally effective. Proper techniques should attempt to reduce the energy usage and thereby increase network lifetime.

Scalability:
Sensor nodes deployed in a sensing area should be optimal. To accommodate some more nodes in the future, network scalability is one of main hurdles to achieve this objective. Scalability in the sensor network indicates the ability to handle growing amounts of work in effective manner and be readily enlarged.

Redundancy:
Due to the frequent node failures and inaccessibility of failed nodes, WSNs are required to have high redundancy of nodes so that the failure of new nodes can be negligible.

Storage, Search and Retrieval:
Wireless Sensor Network can produce a large volume of raw data such as continuous time-series of observations over all points in space covered by the network. Since the data source is continuous. Traditional database is not suitable for WSNs.

Production Cost:
The cost of a single node is important to justify overall cost of the network, because the sensor networks consist of a large number of sensor nodes.

Latency:
Latency refers to delay from when a sender sends a packet until the packet is successfully received by the receiver.

VI. CONCLUSION:

In this paper, the basic parts of sensor nodes, the technology used with the wireless sensor network have been explained. This is followed by the advantages, applications and challenges of wireless sensor network. The applications provide some key attributes that determines the driving force behind WSN research. There are many challenges but due to the scarce energy resources of sensors, energy efficiency is one of the main challenges in the design of protocols for WSNs. The ultimate objective behind the design is to keep the sensors life time as long as possible.

ACKNOWLEDGEMENT:
The authors thank the managements of Dr.N.G.P Arts and Science College, Dr. SNS Rajalakshmi College of Arts & Science, Bharathiar University, Coimbatore for providing infrastructure and other facilities for doing the research work.

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